भारतीय मानक

Indian Standard

IS 1448 (Part 72) : 2023

पेट्रोलियम और उसके उत्पादों के लिए परीक्षण के तरीके

भाग 72 तरल पेट्रोलियम गैसों की वॉलेटिलिटी परीक्षण की विधि

(पहला पुनरीक्षण)

Methods of Test for Petroleum and Its Products

Part 72 Volatility Test of Liquified Petroleum Gases

(First Revision)

ICS 75.160.30

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May 2023 **Price Group 5**

Methods for Sampling and Test for Petroleum and Related Products of Natural or Synthetic Origin (Excluding Bitumen) Sectional Committee, PCD 01

FOREWORD

This Indian Standard (Part 72) (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Methods for Sampling and Test for Petroleum and Related Products of Natural or Synthetic Origin (Excluding Bitumen) Sectional Committee had been approved by the Petroleum, Coal and Related Products Division Council.

This standard elucidates the procedure for ‘Determination of Volatility of Liquefied Petroleum Gases’.

This standard was first published in 1968, which was subsequently reprinted in 1988 and reaffirmed in the year 2003. The first revision has been taken up to keep pace with the latest technological developments and international practices. In this revision following major changes have been made:

a) Specification of thermometer has been modified.

The composition of the committee responsible for the formulation of this standard is listed in Annex A.

In reporting the results of a test analysis made in accordance with this standard, if the final Value, observed or calculation, is to be rounded off, it shall be done in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*)’.

Indian Standard

METHODS OF TEST FOR PETROLEUM AND ITS PRODUCTS

PART 72 VOLATILITY TEST OF LIQUIFIED PETROLEUM GASES

(First Revision)

1 SCOPE

This standard prescribes, method of test for determination of the volatility of various types of liquefied petroleum gases.

2 SIGNIFICANCE

The test results may be expressed in terms of measured volumes. The method provides an indication of the quantity and nature of materials in the product that are substantially less volatile than the liquefied petroleum gas hydrocarbons. Since the volatility, expressed in terms of 95 percent evaporated product, is a measure of the amount of lowest volatile components of the product.

3 OUTLINE OF THE METHOD

Liquefied Petroleum Gas sample of 100 ml volume is evaporated (weathered) under specified conditions, in centrifuge tube of 100 ml capacity. The temperature is observed when 95 percent of initial sample volume has evaporated.

4 APPARATUS

4.1 Centrifuge Tube

4.2 Tube shall contain an armored or suitably fitted thermometer as specified in **4.5** with tip at a distance of 21 mm ± 1 mm from the inside bottom-edge tube as shown in Fig. 1.

4.3 Tube Mouth Plug

Made of any suitable material such as slotted cork or cotton wool or cleansing tissue, or by any appropriate way plug mouth of centrifuge tube.

4.4 Precooling System

4.4.1 *Cooling Coil*

The coil minimum length of 6 m (approx. 20 ft) of 4.8 mm outside diameter wound copper tubing with diameter 63 mm ± 1 mm outer diameter, assembled in suitable cooling bath as in Fig. 2.

4.4.2 *Cooling Bath*

Bath with suitable dimensions to accommodate the cooling coil, (equivalent to dewar flask) ensuring to accommodate the frothing which may occur due to filling any cooling liquid.

4.4.3 *Cooling Liquid* — Criteria for selecting cooling liquid should be the boiling point, lower than the initial boiling point of the sample

4.4.4 *Charcoal* — Requirement is activated charcoal of approximately 6 to 14 mesh size

The tube shall be made of thoroughly annealed heat resistant glass of 100 ml capacity. It should be cone shaped, complying with the dimensions of shown in Fig. 1. The first 0.5 ml shall be graduated in 0.05 ml increments. Also the volumetric graduations tolerances, based on air free water at 20 °C, listed in Table 1.

Table 1 Centrifuge Tube Graduation Tolerances

(*Clause* 4.1)

Sl No. (1)	**Range** ml (2)	**Scale Division,** ml (3)	**Limit of Error** ml (4)
i)	0.0 - 0.1	0.05	0.02
ii)	0.1 - 0.3	0.05	0.03
iii)	0.3 - 0.5	0.05	0.05
iv)	0.5 - 1.0	0.1	0.05
v)	1.0 - 3.0	0.1	0.1
vi)	3.0 - 5.0	0.5	0.2
vii)	5.0 - 25.0	1.0	0.5
ix)	25.0 - 100.0	1.0	1.0

4.5 Thermometer

4.5.1 Thermometer shall conform to IS 2480 (Part 1), schedule mark 1 for low range that is – 100 °C to + 50 °C and IS 2480 (Part 1), schedule mark 2 for high range that is – 50 °C to + 60 °C

4.5.2 The armour from thermometer not to be removed during the test. Place the bottom of the armour as shown in the Fig. 1 as low as possible. Pipette out 5 ml of water and observe the water level in the tube. The 5 percent residue readings are to be taken at the same level with the armoured thermometer in the same position.

4.6 Tube Support — Means shall be provided for supporting the weathering tube by its neck in a vertical position

4.7 Barometer — Any suitable pressure measuring equipment capable of measuring pressure having accuracy of 1 mm Hg

4.8 Copper Wire — Dimensions having diameter with 1.6 mm ± 0.1 mm and length 300 mm ± 10 mm

5 PROCEDURE

5.1 Obtaining the Test Sample

Fill the cooling bath with the cooling liquid so as to cover the cooling coil. Although the inlet of cooling coil to the source from which the sample is to be taken with a short line connection pipe of 6 mm diameter having a sampling valve large enough to prevent vaporization of the material due to the drop in the pressure across the valve seal. Purge the sampling line and cooling coil by opening both the sampling valves and the 3 mm needle valve on the downstream end of the cooling coil. Fill the centrifuge tube with the sample flowing through cooling coil. Empty this first sample, add one or two grains of charcoal, and then refill the centrifuge tube to the 100 ml mark with fresh liquid sample passing through the cooling coil. Carefully insert into centrifuge tube the pre-cooled armoured thermometer and copper wire up to desired depth (*see* **4.2**). The other end of copper wire to connected to earthing for discharging the static charges generated during handling LPG. Center the armoured thermometer and copper wire in the tube by means of a clotted cork.

5.2 Weathering of LPG

5.2.1 *Butane, Propane — Propane Mixture Types*

If the temperature of the sample is below – 12 °C, allow it to weather in the temperature until the temperature has reached – 12 °C. At this point, place the weathering tube with the armoured thermometer till in place in the water in vertical position submerging it to the 1.5 ml mark and allow the contents to weather.

5.2.2 *Propane Type*

Allow the sample to weather in the atmosphere taking care to disturb the frost on the tube as little as possible. An Acetone or alcohol swab can be used to remove frost sufficient to permit reading of the temperature.

5.2.3 *Reading of Temperature*

When the liquid in the weathering tub, with the armoured thermometer in place, corresponds with the level previously determined after 5 ml water was introduced in the weathering tube, read and record the temperature of the sample in accordance with **5.2.1** or **5.2.2** depending upon the type of LPG sample.

5.2.4 *Temperature Correction*

Following the final temperature reading (s*ee* **5.2.3**), remove the armoured thermometer from the weathering tube and place it in the bath of finely crushed ice up to the immersion point. Observe the reading of thermometer when a constant reading is obtained. If the thermometer reading is thermometer reading is less than 0 °C, read this difference, this shall be added to the final test reading. If the thermometer reading is more than zero, again read the difference, this difference shall be subtracted from the final test reading. Any thermometer which varies more than 0.6 °C in either direction shall be discarded.

6 INTERPRETATION OF RESULTS

6.1 Correct the thermometer reading at the 95 percent boiling point (5 percent residue) for temperature error (*see* **5.2.4**).

6.2 Correct the observed temperature for the thermometer error from the observed atmospheric pressure in mm Hg to a base barometric pressure of 760 mm Hg.

6.3 In the weathering test for propane, add 0.3 °C to the corrected temperature for each 10 mm Hg that the test is conducted below 760 mm Hg pressure, or subtract 0.3 °C from the observed temperature for each 10 mm Hg pressure that the test is conducted above 760 mm Hg.

6.4 In the weathering test for butane and propane-butane mixture, add 0.4 °C to the corrected temperature for each 10 mm Hg that the test is conducted below 760 mm Hg pressure, or subtract 0.4 °C from the observed temperature for each 10 mm Hg pressure that the test is conducted above 760 mm Hg.

7 REPORT

Report the corrected value to the nearest 0.1 °C as 95 percent boiling point temperature at 760 mm Hg.

8 PRECISION AND BIAS

Results of duplicate tests shall not differ by more than the following.

Type of LPG	*Repeatability*	*Reproducibility*
Propane	0.5 °C	1.0 °C
Butane and Butane-propane mixture	0.5 °C	1.3 °C

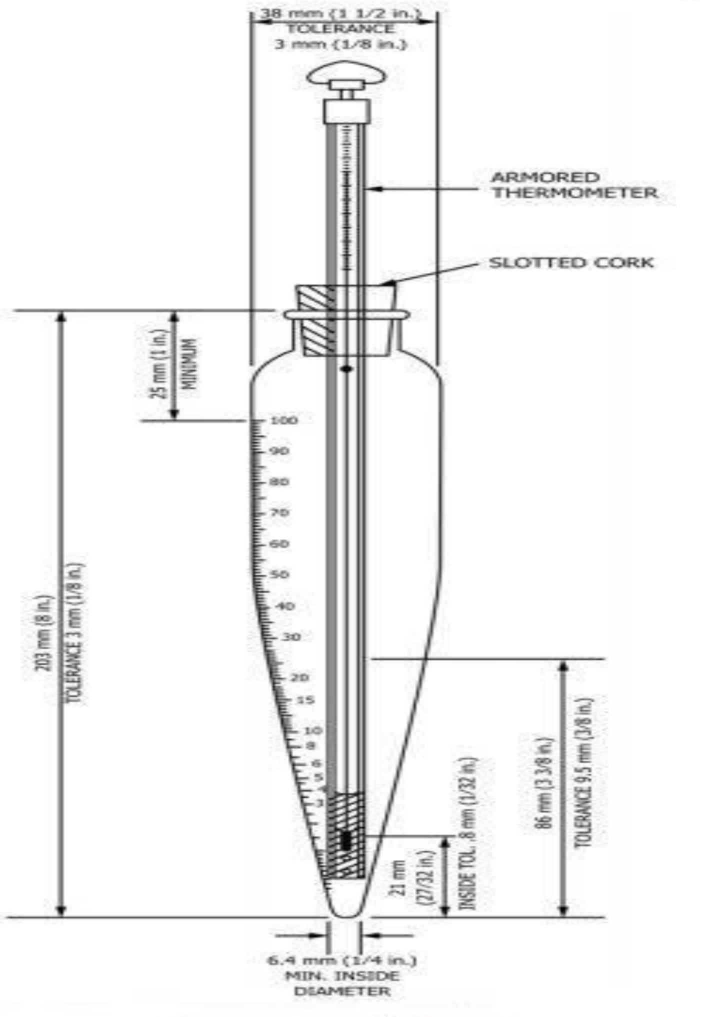

FIG. 1 CENTRIFUGE TUBE

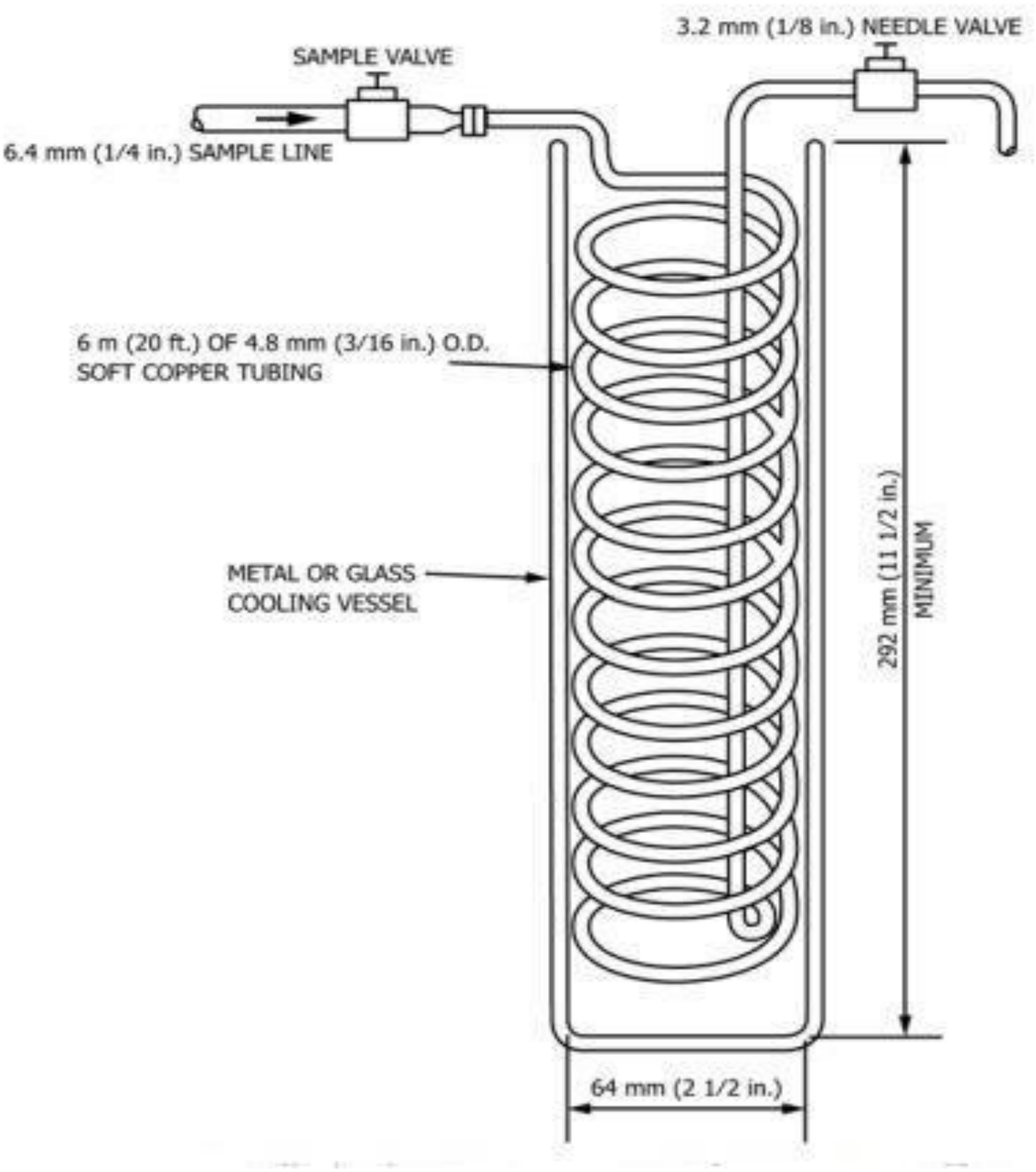

FIG. 2 PRECOOLING COIL

ANNEX A

(*Foreword*)

COMMITTEE COMPOSITION

Methods for Sampling and Test for Petroleum and Related Products of Natural or Synthetic Origin (Excluding Bitumen) Sectional Committee, PCD 01

Organization	*Representative(s)*
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